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California 91103 USA

Patents ADP number *(if you know it)*

06051467001

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4. Title of the invention

PRESSURE SENSITIVE ADHESIVE COMPOSITIONS

5. Name of your agent *(if you have one)*

BARON & WARREN

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Cyclodextrin Containing Hydrocolloid Pressure Sensitive Adhesives

This invention relates to pressure sensitive adhesive compositions containing hydrocolloids. Pressure sensitive adhesives are employed in many fields. Pressure sensitive adhesives are used, *inter alia*, as components of labels, industrial tapes, postage stamps, stationery products, and in medical products such as surgical drapes, tapes, ostomy products and wound care products. It is often desired to add small quantities of an agent to a pressure sensitive adhesive to confer additional benefits. For example, skin problems are common for persons who have a stoma, which is an artificial body opening produced as a result of surgery. PCT Application WO 98/01167 discloses in this regard a hydrocolloid pressure sensitive adhesive containing an amount of aloe vera up to 5wt% which is said to offer a better protection of the skin against the aggressive action of excreted substances. Again, in European Patent Specification No. 0 023 395 B1, mention is made of pressure sensitive adhesives containing a broad spectrum antimicrobial agent. In this prior art, the antimicrobial agent is dissolved in a suitable solvent and dispersed in the said pressure sensitive adhesive to give a two-phase system, which is said to release the antimicrobial agent in a controlled way.

Hydrocolloid adhesives are a unique kind of medically useful pressure sensitive adhesive. They have (at least) two phases - a rubbery phase which provides pressure sensitive tack, sometimes called "dry tack", and dispersed within the continuous rubbery phase is a discontinuous phase of absorbent material. Depending upon the nature of the absorbents, and especially whether the absorbent is soluble in aqueous media or merely swellable, the adhesive composition can develop "wet tack" as it becomes imbibed with fluid. Such wet tack can also influence the adhesive power of the hydrocolloid. Hydrocolloid adhesives thus have a duality of attributes in that they are inherently adhesive and inherently absorbent. They are useful as wound dressings because they can be applied directly to open wounds and can be secured on the

rrounding intact skin, and as skin barriers because they protect the peristomal skin of ostomy patients. Hydrocolloid adhesives maintain the skin in a normally or optimally hydrated condition. Optimally hydrated skin is less subject to irritation and injury from repeated application and removal of adhesives than is macerated skin, which latter can result from the use of conventional pressure sensitive adhesives on the skin.

Many hydrocolloid skin barriers are known and are used especially in the fields of ostomy care and wound care. It is convenient to divide these into "integrated" compositions and "non-integrated" compositions. In this context, "integrated" means those compositions that substantially retain their dimensional stability and form when saturated with wound exudate and/or other body fluid. Integrated hydrocolloids usually contain cross-linked or pseudo cross-linked rubbery matrices in the continuous phase to provide the integrating network. But specific combinations of absorbents have also been reported to give highly integrated hydrocolloids, even in the absence of a cross-linked rubbery matrix. "Non-integrated" means those compositions which become soft gels and amorphous as they become saturated with fluid. In this invention, both integrated and non-integrated hydrocolloids are encompassed.

According to a first aspect of the present invention there is provided a pressure sensitive adhesive composition comprising a rubbery continuous phase and an absorbent discontinuous phase, wherein the absorbent phase comprises a hydrocolloid and 0.1 to 65 wt%, preferably at least 5 wt% of a cyclodextrin material, said percentages being based on the total composition. The preferred minimum of cyclodextrin in a composition according to this aspect of the invention is 10 wt%.

Non-limiting examples of prior art hydrocolloid compositions suitable for use as bases for the reduction to practise of the present invention, with appropriate modification in accord with the teachings herein described, are given in US Patent 3,339,546, US Patent 4,231,369, US Patent 4,477,325, US Patent 4,738,257, US Patent 4,551,490, US Patent 4,192,785, US Patent 4,952,618, all of which patents are incorporated herein by reference.

The present invention also provides skin barriers and wound dressings comprising a layer of hydrocolloid adhesive containing an effective amount of a cyclodextrin and

which is backed by a non-adhesive, waterproof film to form a skin barrier or dressing. The skin barrier is used in a number of ways. One of these is for wound dressing purposes. Patients in institutional settings such as hospitals and nursing homes often have or acquire chronic wounds such as venostasis ulcers and bed sores, and these wounds can possess a very offensive odour. Bandages or dressings made from or incorporating the compositions of the invention are able to absorb odour molecules and thereby reduce or eliminate the offensive odour. This contributes to the well-being of the patient as well as to the nursing staff and other patients, since the odours from chronic wounds can be offensive to both carers and to family members of the patient. Another important use is for the protection of the skin around body openings, especially around the surgically created openings known as colostomies, ileostomies and urostomies. Collectively, these surgically created body openings are often termed stomas. The novel skin barriers of the invention are able to absorb the odour molecules that are associated with faeces and urine and thus are able to assist in the control of the odour that is associated with stomas. This can increase the self-confidence of the patient because such odours can be a source of personal embarrassment. While not wishing to be bound by any particular theory, it is believed that the cyclodextrin molecules are able to absorb malodorous molecules, which become complexed within the toroidal structure of the cyclodextrin molecule.

A further aspect of the present invention relates to constructions comprising a layer of cyclodextrin containing hydrocolloid adhesive that further contains an effective amount of one or more active ingredients. Hydrocolloid adhesives are particularly suitable as the basis for such constructions, because of their ability to maintain the skin in a normally or optimally hydrated condition. Often, such skin patches will be applied to the skin over an extended period, and hydrocolloid adhesives will maintain the skin in a healthy condition. As non-limiting examples of what is contemplated, the active ingredient may be an antibacterial or antifungal compound, a compound such as hydroquinone, a compound such as an essential oil, for example tea tree oil, or mixtures of essential oils, a compound such as salicylic acid, a compound such as menthol, or a fragrance composition. Hydrocolloid adhesives containing such active ingredients can be made into, for example, skin patches that will deliver the active ingredient to the skin surface. The advantage of using cyclodextrin complexes of these active ingredients is that often the active ingredients are labile, or not soluble, or not

ble, or may intera ith other ingredients in the formulati . Inclusion of these active ingredients within the molecular structure of the cyclodextrins provides an effective way of insuring delivery to the target skin site. It will be understood that, within the scope of the invention, the active ingredient does not have to be complexed within the cyclodextrin molecule – it can also be present in a free, or uncomplexed, state. The cyclodextrin will function in such cases as odour absorbing means, and/or as absorbing means. In the case of compositions containing more than one active ingredient, again the complexing of one or more of the active ingredients within a cyclodextrin molecule is optional.

Complexing is a preferred feature however, and according to a further aspect of the invention there is provided a pressure sensitive hydrocolloid adhesive composition containing 1 to 10 wt% of cyclodextrin, all or part of which is complexed with one or more active ingredients of this composition.

Hydrocolloid adhesives containing fragrance compositions are very useful to mask the bad odours associated with the presence of urine and faeces on the skin, which can occur with ostomy patients. Often, fragrances can be irritating to the skin, or can cause allergic reactions. When the fragrances are first complexed with a cyclodextrin material, the fragrance is released when the cyclodextrin becomes moist, and the amount liberated is controlled by the rate and amount of moisture ingress. In this way, any irritation potential or allergic response with the particular fragrance is minimised or eliminated.

The introduction of cyclodextrins into pressure sensitive adhesives is known and is reported in the prior art. For example, US Patent 5,352,717 describes a pressure sensitive adhesive containing a small amount of cyclodextrin and a blowing agent to expand the adhesive to a foamed material for industrial uses. Again, Japanese Patent Application JP 6158002A describes an antibacterial pressure sensitive adhesive for food containers, wherein isothiocyanuric acid ester is complexed within β-cyclodextrin and added to a pressure sensitive adhesive which is then adhered to the inside surface of the food container to control bacterial and fungal growth.

hat is surprising and unexpected in the instant invention is that, if cyclodextrins are employed as the integral absorbant filler, or as part of the integral absorbent fillers, in hydrocolloid adhesives, the resulting compositions have a unique and wide versatility. They are capable of adhering to surfaces, absorbing fluids, absorbing odours, providing a fragrance and delivering active substances. There is no indication or suggestion in the literature to add or incorporate cyclodextrins into hydrocolloid adhesives, nor any indication or suggestion that such addition should yield the advantageous results of odour control and reduction. Further, is there no suggestion or indication that fragrances and active ingredients may advantageously be delivered to the skin by incorporating them into such cyclodextrin containing hydrocolloid adhesives.

The adhesive of the invention comprises any suitable pressure sensitive adhesive matrix known in the art and having hydrocolloid particles and/or cyclodextrins dispersed therein. The permanently tacky pressure sensitive adhesive component must be tacky at room temperature as well as at the skin temperature of patients. Also, the adhesive must be dermatologically acceptable, which means that after continuous contact with skin there is little adhesive residue upon removal and there is no significant reaction with the skin during the adhesion period. The adhesive strength of the continuous phase must be sufficient to adhere to the skin of the patient for the time determined by the use of the medical device of which the adhesive forms part. Other ingredients such as tackifiers, plasticisers, and polymer stabilisers may be added to the continuous rubbery phase, to modify tack and optimise adhesion properties and to protect polymers from degradation during processing.

The adhesive matrix may be based on for example polyisobutylene, butyl rubber, polyacrylates, polyurethanes, silicone gum, natural gum rubber, SBR rubber or polyvinyl ether. Thermoplastic elastomers such as styrene-isoprene-styrene block copolymers and styrene-ethylene/propylene-styrene block copolymers may be used, and these may require optional tackifiers and plasticisers. Blends or mixtures of elastomers may be employed. Conventional additives such as tackifiers, softeners, plasticisers and antioxidants may be present to modify, adjust and stabilise the adhesive and other properties of the matrix. The amount of adhesive matrix with

spect to the total co. osition will generally be from 35wt% . about 99wt% or more.

Suitable hydrocolloids for use in the adhesives in conjunction with the cyclodextrins are naturally occurring hydrocolloids such as pectins, guar gum, karaya gum, locust bean gum, carageenan, tragacanth gum, alginates, xanthan gum, modified naturally derived substances such as sodium carboxymethyl cellulose, synthetic materials such as polvinylalcohol, polyoxyalkylene polyols, polyvinyl pyrollidone, and animal derived materials such as gelatine. Ionic hydrocolloids such as hyaluronic acid, chitosan salts or DEAE Dextran may also be employed. The hydrocolloids may be water absorbable or water swellable, and combinations of one type or of various types may be used in any ratio. The amount of hydrocolloid is from 0wt% to about 60wt% or more, and when combined with the cyclodextrin component the aggregate of the two will amount to from about 0.1wt% to about 65wt%.

The term cyclodextrin, as used herein, includes any of the known cyclodextrins. Cyclodextrin materials are cyclic oligosaccharides containing a minimum of six D-(+)-glucopyranose units attached by α- (1 > 4) glucosidic bonds. Three cyclodextrins called α, β and γ are naturally occurring and have, respectively, six, seven and eight glucose units. Cyclodextrins are known that contain up to twelve glucose units. Cyclodextrin materials can also be manufactured from starch by enzymatic degradation. In addition, many synthetic modifications of the natural material materials are known, for example methyl-β-cyclodextrin and hydroxypropyl-β-cyclodextrin. The conformations of the cyclic structures of these molecules are such that the molecules are arranged in rigid conical molecular shapes that have hollow interiors of very well defined sizes. These internal cavities are hydrophobic in nature because the interior of the toroidal shape is predominantly made up of hydrogen atoms. The interior shapes of the cyclodextrins are able to form inclusion complexes, sometimes referred to as "host-guest" complexes, or clathrate compounds, with organic molecules which fit, completely or partially, into the cavities defined by the toroidal shapes. For example, odiferous molecules can fit into the cavities. This includes both perfumes and malodorous compounds. Cyclodextrins therefore, and especially mixtures of cyclodextrins with cavities of different sizes, can be used to control odours. With respect to odour control, there is scope for two different

proaches within the present invention. First, uncomplexed or free cyclodextrins, dispersed within the adhesive matrix, can be used to absorb malodours. Second, perfumes can be precomplexed with cyclodextrins and then formulated in the final adhesive. The perfume is then released *in situ* and will mask the undesirable odour. (Once a cyclodextrin molecule has released its precomplexed perfume molecule, it is then available to complex a malodorous molecule). The complexation of odorous molecules by cyclodextrin and the release of precomplexed perfume molecules from cyclodextrin are facilitated by the presence of water. It will be understood that the water necessary to facilitate such release of perfume and complexing of malodour by the cyclodextrin is present in the contaminating urine or faeces, and/or is released by the skin through normal transpiration, and will be absorbed by the adhesive.

The choice of cyclodextrin employed in a given formulation will be decided on the basis of the properties desired in the finished product, and the specific role that the cyclodextrin is fulfilling. Unmodified β-cyclodextrin is not very water soluble and is generally not preferred if high absorbancy is needed. α-cyclodextrins, γ-cyclodextrins and certain modified β-cyclodextrins are more water absorbent. Mixtures of cyclodextrins are often preferred, because these will absorb a wider range of malodorous molecules than will a single cyclodextrin. The cyclodextrin to be used for a specific complex will of course be determined by the size and shape of the active molecule to be complexed.

Any active ingredient may be considered for addition to the formulations anticipated by the instant invention. By active ingredient, we mean an ingredient that is not essential to the functioning of the formulation as a moisture and odour absorbing pressure sensitive adhesive. An active ingredient is added to confer an additional benefit to the formulation. It is not necessary that the active ingredient first is complexed with a cyclodextrin prior to mixing into the formulation, nor indeed that it complexes with a cyclodextrin at all, although it will generally be advantageous if the active ingredient is so complexed. The following active ingredients exemplify the scope of the invention, and represent a non-limiting list of active ingredients.

Aspirin, benzocaine, benzyl alcohol, butamben picrate, camphor, camphorated metacresol, chloral hydrate, chlorabutanol, chloraxylenol, cyclomethycaine sulphate,

bucaine, dibucaine hydrochloride, dimethisoquin hydrochloride, diphenhydramine hydrochloride, dyclonine hydrochloride, eugenol, glycol salicylate, hexyl resorcinol, hydrocortisone, hydrocortisone acetate, juniper tar, lidocaine, lidocaine hydrochloride, menthol, methapyrilene hydrochloride, phenol, phenolate sodium, pramoxine hydrochloride, resorcinol, resorcinol monoacetate, salicylamide, tetracaine, tetracaine hydrochloride, thymol, triethanolamine salicylate, tripelennamine hydrochloride, allyl isothiocyanate, ammonia, capsaicin, eucalyptus oil, histamine dihydrochloride, methyl nicotinate, methyl salicylate, turpentine oil, allantoin, calamine, dimethicone, glycerin, kaoline, petrolatum, shark liver oil, zinc acetate, zinc carbonate, zinc oxide, hydroquinone, quinine sulphate, vitamine E, pregnenolone acetate, progesterone, salicylic acid, clioquinol, haloprogin, miconazole nitrate, tolnaftate, undecylenic acid, benzoyl peroxide, sulphur, povidone iodine, benzalkonium chloride, benzethonium chloride, methylbenzethonium chloride, trichlosan, trichlocarban, chlorhexidine gluconate, bacitracin zinc, neomycin sulphate, glycolic acid, tea tree oil, lavender oil.

Active ingredients must be present at sufficient concentrations to achieve the desired effect. In general, however, active ingredients will be present usually at no greater than 10wt%, and preferably at no greater than 5wt%, with respect to the total composition.

Other components such as chemical agents that facilitate release of active ingredients from the adhesive formulations, for example plasticisers and solvents for the active ingredients be optionally be present. Also agents that promote absorption of active ingredients by the skin, may optionally be added to the formulation. Non-limiting examples of such skin permeation enhancers are isopropyl myristate, oleic acid, propylene glycol and laurocapram. Other optional ingredients such as small amounts of pigments or colourants may also be present in the compositions.

st Methods

The formulations in the examples below were evaluated using the following test methods.

Reverse tack

Reverse tack of hydrocolloid adhesives is the maximum force necessary to remove a standard polyester strip brought into contact with the hydrocolloid without external force, from this hydrocolloid surface.

Procedure

Make the test panel self adhesive using double coated tape. Laminate the hydrocolloid adhesive on the test panel. Place the test panel with hydrocolloid in the lower clamp of a tensile testing machine. Program the tensile tester. Place a polyester test strip of thickness 125 μ (5 mils) and dimensions (21 cm x 2.54 cm) in the upper clamp, making sure that the total length of polyester under the clamp (loop) is 15 cm. Remove the release liner from hydrocolloid and start the measurement.

The reverse tack is the maximum force to remove the polyester strip from the hydrocolloid surface.

90° Peel adhesion of hydrocolloid adhesives on SS

Peel adhesion on stainless steel (SS) is the average force to remove a hydrocolloid adhesive, laminated under specified conditions on a SS panel, from the SS panel at constant speed and at an angle of 90°.

Procedure

Clean the SS-panel with solvent. Cut a hydrocolloid sample of 25.4mm width and reinforce with reinforcing tape, laminate a paper strip at one end of the hydrocolloid sample using an overlap of about 1 cm. Remove the liner from the hydrocolloid sample and laminate the sample on the SS-panel with a 450 gm. roller at a speed of 150 cm/min. Allow the sample to dwell for 1 minute. Place the paper strip in the upper clamp and the SS-panel on the lower clamp, making sure that the angle between peel direction and SS-panel is 90°. Start the measurement using a

crosshead speed of 300 mm/min. The angle must be kept 90° until the measurement is completed. The 90° peel adhesion is the average force to remove the hydrocolloid strip from the SS-

Static shear of hydrocolloid adhesives

Static shear is the time necessary to remove a hydrocolloid adhesive, laminated on a stainless steel panel under specified conditions, from the test panel under influence of a specified weight.

Procedure

Condition the hydrocolloid samples at 23 ± 1° and 50 ± 2% relative humidity for 24 hours. Clean the SS shear panel with solvent. Cut a hydrocolloid strip of 25.4 mm width and 50 mm length. Reinforce the hydrocolloid strip with reinforcing tape. Laminate the hydrocolloid strip on the test panel using an overlap surface of 1 inch². Protect the free hydrocolloid with release liner. Put a weight of 500 g on the laminate for 1 hour. Reinforce the free hydrocolloid adhesive zone with reinforcing plastic and perforate. Place the test panel with hydrocolloid on the shear bar using a shear weight of 500 g. Re-zero the registration-clock. Note the time on the clock when sample falls off under the influence of the 500g. Weight. This completes the measurement.

Static absorption of hydrocolloids.

To determine the amount of fluid uptake into a known surface of hydrocolloid adhesive.

Procedure

Laminate release liner to the upper flange of the cup with the double coated tape. This is the contact zone for the hydrocolloid. Fill the cup with 30 ml NaCl solution (0.9%wt). Cut a sample of hydrocolloid of about the same size as the outer cup diameter. Weigh the sample (W_1). Laminate the sample to the cup, making sure that the seal between the hydrocolloid sample and the cup is water tight. Turn the cup upside down and put it in the oven at 37°C. for 24 hours. Cool down. Remove the hydrocolloid from the cup and reweigh (W_2). Calculate the water fluid absorption (g/sq.m.24h) using the formula :

$$abs = (W_2 - W_1) / 0.002375$$

where the area of the hydrocolloid in contact with salt solution is 0.002375 sq.m.

)etermination of cold flow

'he flow of the hydrocolloid under influence of a specified pressure and after a specified time, is measured.

Procedure

Condition the hydrocolloid samples at 23 ± 1°C and 50 ± 2 % relative humidity for 24 hours. Cut 5 samples of hydrocolloid using a 35mm circular die-cutter. Put a silicone paper on top of a first glass plate. Arrange the 5 samples on the silicone paper in a way that pressure is distributed equally. Measure the diameter of each sample with callipers, mark the exact place where the measurement is done. Put a plastic disk on each sample. Put another silicone paper and two glass plates over the construction followed by a weight of 10 kg. (The measurement can also be done by placing the sample with the disk and the 10kg. weight in an oven maintained at 40°C). After 24 hours, measure the diameter of the samples where they are marked. Calculate the % increase of diameter of the samples. The cold flow is the % increase of diameter after 24 hours exposure to 10 kg (for 5 samples). Record the % increase in diameter and the test temperature.

Determination of the integrity of hydrocolloids

The integrity of a hydrocolloid is defined as its ability to resist breakdown by biological fluids. The test measures the weight percentage of hydrocolloid adhesive retained after exposure to saline under specified conditions.

Procedure

Condition the hydrocolloid samples at 23 ± 1°C and 50 ± 2 % relative humidity for 24 hours. Cut circular samples 2.54cm in diameter from hydrocolloid sheet. Weigh and record the samples (W_i). Place each sample in a bottle with 50ml aqueous saline (0.9%wt). Cap the bottles and agitate on the bottle shaker at 400 speed for a period of 18hrs. Remove the sample and dry it in the circulating air oven at 50°C and 50% relative humidity until dry. This takes about 24 hours. Weigh and record the sample (W_f). The Integrity Value of the sample is calculated using the following equation:

$$\text{Integrity value (\%)} = 100 \times \frac{(W_f)}{(W_i)}$$

Preparation of Cyclodextrin Complexes

The preparation of cyclodextrin complexes is described in the literature, and illustrative methods are incorporated herein for reference only.

A complex of γ-cyclodextrin and triclosan was formed by allowing a suspension of triclosan in an aqueous solution of γ-cyclodextrin (molar ratio 1.25 γ-cyclodextrin: 1.0 triclosan) to equilibrate for 24 hours at 25°C. with constant stirring. At equilibrium, a dense white precipitate corresponding to a 1:1 stoichiometric ratio of γ-cyclodextrin to triclosan was formed.

A complex of citral in β-cyclodextrin was prepared by mixing 200ml water and 62gm β-cyclodextrin at room temperature. Citral (7.6gm) was added dropwise to the suspension of β-cyclodextrin. After intensive stirring at room temperature for about 10 hours, the suspension was allowed to stand for a further 24 hours. The complex was filtered and vacuum dried at 40°C.

A complex of citral in γ-cyclodextrin was prepared by dissolving 70gm γ-cyclodextrin in 200ml water at 50°C, and adding citral (7.6gm) dropwise to the γ-cyclodextrin solution. After intensive stirring at 60°C for about 6 hours, the solution was allowed to stand for a further 24 hours. The complex was filtered and vacuum dried at 40°C. The concentration of citral in the γ-cyclodextrin complex was 11wt%.

A complex of evening primrose oil in γ-cyclodextrin at a level of 15wt% oil was prepared by dissolving 70gm γ-cyclodextrin in 200ml water at 45°C, and adding the evening primrose oil dropwise to the γ-cyclodextrin solution. Stirring was continued for 6 hours, and the complex was allowed to cool and stand for a further 24 hours, after which time it was filtered and dried *in vacuo*.

The invention will now be further described with reference to the following non-limiting examples.

Examples 1 – 4

These examples illustrate a cyclodextrin containing hydrocolloid suitable for a WC flushable ostomy pouch. This flushable requirement means that the hydrocolloid should not be integrated, so that it will disintegrate satisfactorily in the sewage system. Example 1 is a hydrocolloid containing polyisobutylene, pectin, gelatine and sodium carboxymethyl cellulose, which was made as a control material. This hydrocolloid, described in US Patent 3,339,546, is an inelastic, non-integrated hydrocolloid adhesive which has been on the market as an ostomy barrier material and as a wound dressing material for many years, and is considered a standard product.

Each formulation was prepared in a 500gm batch in a 1l. Z-blade mixer. The pectin, the sodium carboxymethyl cellulose and the third powder was added to the mixer at 90°C and the powders blended together for 2 minutes. Then the Vistanex LMMH was added to the powders and the formulations were further mixed for 30 minutes at 90°C. The finished hydrocolloid adhesives were made into sheets of approximately 1mm thickness by pressing about 130gm of each formulation between two sheets of silicone release paper in a hydraulic press at 90°C.

Wt% of Each Raw Material	Ex. 1	Ex. 2	Ex. 3	Ex. 4
Polyisobutylene, Vistanex LMMH	40.6	40.6	40.6	40.0
GenuPectin USP 100	19.8	19.8	19.8	-
Sodium CMC, Blanose 7H4XF	19.8	19.8	19.8	-
Gelatine 100 mesh, 225 Bloom	19.8	-	-	-
β-Cyclodextrin (Cavitron 82000)	-	19.8	-	-
Hydroxypropyl β-Cyclodextrin (Cavitron 82005)	-	-	19.8	60.0
Totals, wt%	100	100	100	100

Physical Data	Ex. 1	Ex. 2	Ex. 3	Ex. 4
Reverse Tack, N/25mm	17.5	21.5	20.3	
Peel Adhesion, 90°/ Stainless Steel, N/25mm	8.8	7.9	12.0	
Shear, 0.5kg, minutes	94	68	58	
Thickness,mm	1.27	1.20	1.06	
Static Absorption, gm/sq.m./24hr	7280	7242	7301	
Cold Flow, % increase/24hr/10kg	7.2	18.7	11.7	
Integrity, %, 6hr	65	82	58	

Example 5

The hydrocolloid adhesive of Example 3 was laminated to a spun laced nonwoven fabric which had previously been waterproofed and coated with a medical grade acrylic pressure sensitive adhesive. The acrylic adhesive functions as a tie layer to bond the hydrocolloid adhesive to the polyester fabric. Such an acrylic adhesive coated nonwoven fabric is available commercially from Smith & Nephew plc as Lasso SA72.

The skin barrier so produced was made up into a drainable ostomy pouch having a stoma hole size of 32mm. The stoma pouch was used by a 22 year old ileostomy patient who was experiencing leakage problems with his commercially available pouch. The hydrocolloid adhesive of Example 3 has a high cold flow value, which means that the adhesive flowed easily into the scarred depression on the patient's abdomen close to the stoma.

Although the hydrocolloid on the stoma eroded somewhat within 24 hours, the pouch adhered well, and the adhesive absorbed the odour caused by faecal contamination at the edge of the adhesive exposed close to the stoma opening. The patient was pleased

...h the performance of the pouch, and stated that there was less odour noticeable with the pouch of example 5 compared to his current commercially available pouch.

Examples 6 - 8

Examples 6 - 8 show the effect of substituting cyclodextrins for one ingredient in a moderately integrated hydrocolloid formulation suitable for use as a hydrocolloid wound dressing. Aqualon A-500, which is a crystalline sodium carboxycellulose, was substituted with cyclodextrin material. 500gm batches of each formulation were prepared. The polyisobutylene (Vistanex LMMH), the Pectin, the Blanose sodium CMC and the third powder were added at 90°C to a 1l. Z-blade mixer. After mixing for 15 minutes at 90°C, the temperature was raised to 100°C, and the other ingredient, the preformulated hot melt adhesive, was added and mixed for a further 30 minutes.

The Kraton KD-1161NS is a blend of linear styrene/isoprene/styrene triblock copolymer and linear styrene/isoprene diblock copolymer. Such a material is available from Shell Chemical Company and has a bound styrene content of about 15% and a diblock content of 17%. The mixture of tackifying resins used was a cyclopentadienyl resin, Escorez 2203LC, available from Exxon Chemical, and Adtac LV-E, a C5 synthetic hydrocarbon resin available from Hercules Chemical Company. The Irgafos 168 is an organophosphite stabiliser available from Ciba while the Irganox 565 is a hindered phenolic antioxidant also available from Ciba.

Wt% of Each Raw Material	Ex 6	Ex 7	Ex 8
Polyisobutylene, Vistanex LMMH	28.0	28.0	28.0
GenuPectin USP 100	14.0	14.0	14.0
Sodium CMC, Blanose 7H4XF	14.0	14.0	14.0
Sodium CMC, Aqualon A-500	14.0	-	-
β-Cyclodextrin (Cavitron 82000)	-	14.0	-
Hydroxypropyl β-Cyclodextrin (Cavitron 82005)	-	-	14.0
Kraton D-1161NS	11.3	11.3	11.3
Adtac LV-E	6.0	6.0	6.0
Escorez 2203 LC	12.5	12.5	12.5
Irgafos 168	0.14	0.14	0.14
Irganox 565	0.07	0.07	0.07
Total	100	100	100

Physical Data	Ex 6	Ex 7	Ex 8
Reverse Tack, N/25mm	27.3	34.6	23.7
Peel Adhesion, 90°/SS, N/25mm	12.7	16.0	16.6
Shear, 0.5kg, minutes	129	190	237
Thickness, mm	0.67	0.75	0.70
Static Absorption, gm/sq.m./24hr	6265	3789	4648
Cold Flow, % increase/24hr/10kg	0.8	4.7	3.5
Integrity, %, 24hr.	50	78	74

Example 9

This example illustrates the preparation of a self adhesive acne pad using the teachings of the invention. The self adhesive pad contains a complex of β-cyclodextrin containing 10wt% tea tree oil, and available as EPICUTIN-TT from Chemisches Laboratorium Dr. Kurt Richter GmbH, Berlin, Germany. This complex, although containing 10wt% tea tree oil, had no odour of the essential oil, which is liberated only by moisture.

Salicylic acid (20.0 gm) was added to polyethylene glycol PEG400 (40.0 gm) in a 100ml. screw capped bottle. The PEG400 is available from Clariant GmbH. The bottle was shaken overnight on an automatic shaker and most of the salicylic acid dissolved to make a viscous suspension.

Separately, a hot melt adhesive was prepared from Kraton KD-1161N, plasticised with a styrene-isoprene liquid rubber, LVSI-101. The Kraton KD-1161N is a blend of linear styrene/isoprene/styrene triblock copolymer and linear styrene/isoprene diblock copolymer. This material is available from Shell Chemical Company and has a bound styrene content of about 15% and a diblock content of 17%. The LVSI-101 is a block copolymer of styrene and isoprene having a styrene content of about 13% and an isoprene content of about 87%, a glass transition of about -60°C, a melt viscosity of about 2400 poises at 50°C and which is commercially available from Shell Chemical Company. Irganox 1010, a hindered phenolic antioxidant manufactured by Ciba, was used to stabilise the hot melt adhesive against thermal degradation during manufacture.

From the details given in PCT Application No: GB98/02069 the following procedure was followed. A Z-blade mixer was purged with nitrogen gas and heated to 160°C.

ıe speed of the front, faster blade was 30 rpm. Kraton KD-1161N (100gm) and Irganox 1010 stabiliser (4.0gm) were charged to the mixer at 160°C, and the mixer was started. After mixing for 5 minutes, the rubbery crumb coalesed, and 50gm of liquid rubber styrene-isoprene copolymer, LVSI-101, was added with continued mixing and nitrogen purging. After a further ten minutes, the temperature was raised to 170°C and the mixer front blade speed increased to 47rpm. The LVSI-101 had at this point completely mixed with the rubber, and a further 50gm of LVSI-101 was added. Ten minutes later, after blending of the second portion of the LVSI-101, a further 49gm of LVSI-101 was added, and mixed for a further 10 minutes. In this way, approximately 50gm portions of the charge of LVSI were added every 10 minutes until a total of 400gm of LVSI-101 had been added. After a further 15 minutes, the intermediate adhesive was dumped from the mixer. The total time for this operation was about 90 minutes.

Formula 2-18A	Gm.
LVSI-101	400
Kraton KD-1161N	100
Irganox 1010	4

From this intermediate mixture, referred to as Formula No 2-18A in the Tables, a finished hydrocolloid adhesive was made having the formula shown below. The Pectin USP100, NaCMC Blanose and the Vistanex polyisobutylene were mixed in the Z-blade mixer at 80°C. and the intermediate adhesive 2-18A was added at 100°C. The mixer was then cooled back to 80°C and the suspension of salicylic acid in PEG400 was added. After further mixing for 15 minutes, the mixer was cooled to 60°C, and the Epicutin-TT was added with additional mixing for 15 minutes, prior to dumping the adhesive.

Example 9	Gm.
2-18A	182.35
Vistanex LMMH	72.95
Pectin USP100	35.35
NaCMC, Blanose	35.35
PEG400	16.00
Salicylic Acid	8.00
Epicutin-TT	50.00
Total Weight	400.00

The adhesive thus contained 2.00wt% salicylic acid and 1.25wt% of tea tree oil. The adhesive was pressed between two sheets of silicone release paper in a hydraulic press at 90°C. After removing one protective silicone release paper, the sheet of adhesive was laminated to a non woven fabric, previously transfer coated with a medical grade acrylic adhesive which acts as a tie coat to bond the hydrocolloid adhesive to the fabric. Discs of the construction, 2cm in diameter, were cut. Four of the adhesive discs were applied over five days to an acne lesion on the back of a 41-year-old Caucasian female with a long history of pre-menstrual acne outbreaks. The following observations were made:

Day	No. of Disc	Adhesion level	Condition of intact skin under disc after removal	Assessment of acne after removal of disc
Day 0	-	-	-	Painful raised pimple (initial assessment)
Day 1	Disc 1	Excellent	No sign of skin redness	Pimple redness reduced, Small comedone visible
Day 2	Disc 2	Excellent	No sign of skin redness	Raised pimple reduced
Day 3	Disc 2	Excellent	(Disc left for 48 hrs)	-
Day 4	Disc 3	Excellent	Very slight sign of skin redness	Drying of lesion, comedone disappeared
Day 5	Disc 4	Excellent	No sign of skin redness	Further drying of lesion

There was a significant visual improvement over the five days in the healing of the treated acne lesion compared to an untreated lesion on the same patient. The patient found that the discs had excellent adhesion to skin. The disc, even though covered by clothing, never became adhered at its edges to the clothing, demonstrating the excellent cold flow performance of this adhesive patch. The patch gave satisfactory control of acne lesions during the peri-menstrual time.

Summary

This invention is directed at compositions which are normally pressure sensitive adhesive, and which are also absorbent of fluids, especially body fluids, and which contain an effective amount of a cyclodextrin material. The amount of cyclodextrin material can vary from 0.1 to about 65wt%, and the amount present will depend on the particular properties desired in the absorbent adhesive. Lower amounts of cyclodextrin, from 0.1 – 10wt%, can confer odour absorbing properties on the adhesive, useful in consumer and medical products. Optionally, the adhesive compositions may also contain relatively small amounts of other active ingredients such as antimicrobial components, active drug ingredients, fragrances, etc, and, if present, these optional active ingredients may often advantageously, but optionally, be complexed within the cyclodextrin molecules. In these latter cases the cyclodextrin materials are acting as carriers for the active ingredients in the adhesives. Such compositions are useful in many ways such as antibacterial pressure sensitive adhesives, pressure sensitive adhesives that bleach the skin, pressure sensitive adhesives that prevent and diminish acne skin blemishes, pressure sensitive adhesives that provide a cooling or warming sensation to the skin, etc. Higher amounts of cyclodextrins, up to 65wt% of the composition, either alone or in combination with other absorbent fillers to total up to 65wt%, give compositions that are more absorbent of body fluids than are compositions with lesser amounts of absorbents. These latter compositions find utility especially in the medical field as barrier adhesives for ostomy patients and as wound dressings, and are particularly useful in that they provide fluid absorbent adhesives that also possess odour absorbing properties. Such adhesives are particularly useful as ostomy adhesives, where they can help in the absorption of the malodour associated with faeces and urine, as components of dressings for malodorous wounds and as adhesive patches to treat one or more skin conditions.

PCT | GB00 | 02895

15-8-00

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